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(71) Applicant
Security Services PLC

(Incorporated in United Kingdom)

Vigilant House, P. O. Box 23, 24 Gillingham Street,
London SW1V 1HZ

(72) Inventor
Ian S Parry

(74) Agent and/or Address for Service
J. A. Kemp & Co.
14 South Square, Gray's Inn, London WC1R 5EU

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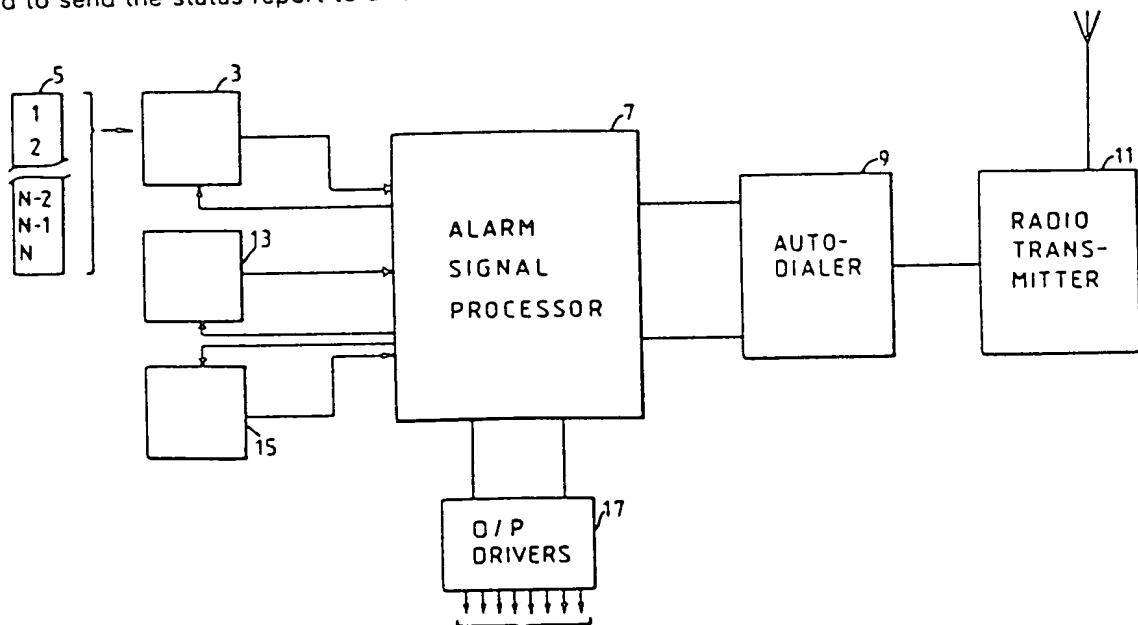
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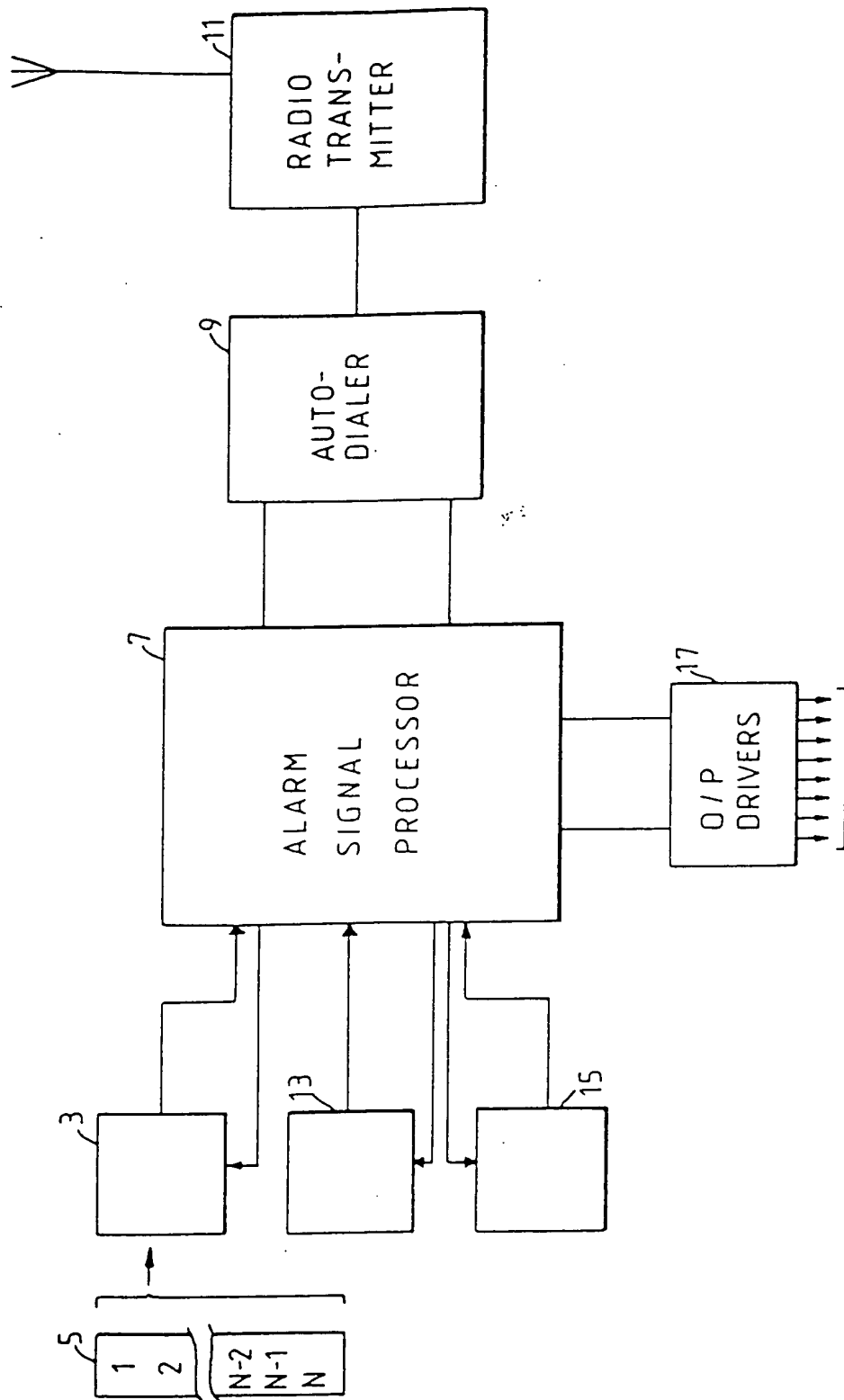
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(54) Status reporting apparatus

(57) Status reporting apparatus comprises a number of sensors 5 which monitor a status or security condition, and circuitry 3, 7, 13, 15 which produce a status report comprising the identity and location of the apparatus and an indication of the status condition. An auto-dialer 9 connected to a cellular telephone 11 is used to send the status report to a remote location.



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SPECIFICATION

Status reporting apparatus

5 The present invention relates to status reporting apparatus for providing a status signal indicative of some aspect of the status of the environment with which the apparatus is associated or in which it is installed.

10 A typical application with which the present invention is concerned is in the monitoring of a security or hazard condition. Thus, for example, the apparatus may be used with one or more sensors which detect a security condition (such as an attempted break in of premises or a break in to a vehicle) or a hazard condition such as the detection of smoke, gas, fire or the like.

It is, of course, known to distribute security or hazard sensors around a space which is of interest and to direct the signals derived from them to a central console where they can be displayed. This console may include TV screens to show the outputs of surveillance cameras and various types of visual and audible alarm devices and displays.

In a first aspect, the invention is broadly concerned with status monitoring apparatus which has the facility automatically to respond to and to report status conditions to a remote location via a communication link which the monitoring apparatus programmed to establish via a suitable medium. Thus, for example, the medium of the communication link may be a cellular radio/telephone network, with the apparatus being provided with an autodialler for dialling the number of the location to which the status condition is to be reported. Equally, the communication medium could comprise radio links as, for example, are intended to be provided on the proposed Band 3 services whereby subscribers may transmit radio messages from one location to another via a radio repeater network with the network functioning to channel the message through the appropriate route of radio base stations and network switches to reach the desired destination.

In a second aspect, the invention provides a status reporting apparatus which is adapted to establish a communication link via a switching communication network which includes a radio link (e.g. the cellular radio facility of a telephone system) so as to enable a status report, whether or not generated automatically, to be reported to a remote location.

As will become apparent from the following description, both aspects of the invention may be embodied in the same apparatus, so that it has the facility to respond automatically to a particular status condition and report the occurrence of that condition via a switched communication network to a remote location.

Use of a radio link either as the whole of the link or part, frees the apparatus from

needing to be connected to land lines or conventional telephone network switching cables.

This is advantageous in security applications because it prevents the apparatus being disabled by the telephone line being cut and it enables it to be applied in cases where the apparatus will move during use, for example, where it is installed in a vehicle (which may be provided with a theft alarm), in a boat or other vessel or where it is installed in, say, a freight container or the like. However, to ensure the integrity of the radio link, it is necessary to cause an alarm activation if the radio antenna is tampered with and/or to provide physical security for the antenna (e.g. by mounting it in a protective dielectric enclosure or in secure premises).

The status report may comprise a voice message (whether as a recording or digitally synthesized), one or more status condition values (e.g. "intruder detected") and/or location information. In the case of apparatus installed on premises, the location information may be the address of those premises or, in the case of apparatus for monitoring a movable object, such as a vehicle, a vessel or freight, the last reported location of the object. Naturally, also, the report may include identification information to identify the apparatus in question as being the source of the message, and would need to if more than one apparatus reports to the same remote location.

In the following, the present invention will be described primarily with reference to its application to security and hazard monitoring systems but it will be appreciated that it is equally applicable to a wide variety of other applications with suitable changes of detail, where appropriate, to adapt it to the application in question.

The invention will be further described by way of non-limitative example with reference to the accompanying drawings in which the Figure shows a status monitoring and reporting apparatus 1 in accordance with the present invention which operates to monitor a status condition, for example the security condition or premises or a vehicle, in which the apparatus 1 is installed and to report the occurrence of a relevant status condition to a remote installation via a communication link such as cellular radio. The remote installation, (hereinafter referred to as the "host" for short) may be the home or other premises of the owner of the installation/vehicle, the emergency services or a person or company designated to deal with the status condition report.

For example, in security applications, the status condition could be a security condition such as an intruder detector being activated. In other applications other status conditions would be relevant—e.g. in monitoring the temperature of a refrigerated store, a relevant condition might be an overtemperature condition.

tion in the refrigeration space, while in a process control application, an overpressure, overtemperature or similar condition might be relevant.

- 5 The status report can be simply an on/off indication that a reportable condition has occurred or can give an indication of the nature and/or degree of the condition in question.

The apparatus 1 suitably comprises:-

- 10 1) A status condition monitoring block 3 which monitors status signals, from one or more status sensors 5 and in response to one or more predetermined conditions of those signals generates a status report request.

- 15 These signals may be derived from transducers (e.g. intruder detectors in a security application) or from a user-operable control (e.g. an alarm button).

- 20 2) An alarm signal processor 7 which responds to the status report request and controls the conduct of the status-reporting and subsequent procedure.

- 25 3) An automatic telephone dialler 9 controlled by the processor 5 and operative to carry out a dial-out to a telephone number specified by the processor 7.

- 30 4) A cellular radio (or other radio) network handset/transmitter 11 for linking the apparatus with a public or private telephone switching network so that the status report can be made and to enable a two-way exchange of data, including commands from the remote installation to the apparatus 1.

- 35 Additionally, the apparatus may include one or more of the following:-

- 5) An identification signal generator 13 to generate an identification signal unique to the apparatus 1 and so identify it.

- 40 6) A location signal generator 15 which may produce a signal indicating the position of the apparatus 1. For example in a vehicle or vessel security application, the location signal generator 15 could provide a signal indicative of the current location of the apparatus 1.

- 45 Generation of these signals may take place under the control of the alarm signal processor 7 so that the identification and/or location signals are automatically transmitted to the host via the communication link established during the status report procedure by the alarm signal processor 7.

- 50 The processor 7 can be programmed so as to call the same number for all status reports or different numbers for different kinds of status reports (e.g. break-ins and fire alerts).

- 55 7) An output command interface 17, which can be used to deliver commands received from the remote host to equipment associated with the apparatus 1. For example, the processor 7 may be programmed to respond to digital code words received from the host during the condition reporting procedure to activate or deactivate local equipment (e.g. turn local alarms on or off in a security application
60 or shut down a piece of plant or take other

remedial action in a process control or environmental control application).

- 70 The processor 7 may further be programmed so that its own subsequent operation is modified by commands received from the host via the communications link. For example the processor 7 can be instructed to ignore one or more alarm conditions (e.g. where a fault has been diagnosed by the host)
75 or to adjust alarm limits so as to render the apparatus more or less sensitive to particular status signals.

- The commands can also be used to activate additional status monitoring equipment for
80 example one or more surveillance cameras could be activated and images received by them can be sent in a slow scan (i.e. time-stretched) mode, via the communication link set up by the processor 7, to the host for
85 viewing.

- As regards the identification and location signal blocks 13 and 15, both the identification and location signals may be digital codes which may be transmitted as voice signals
90 (whether recorded human voices or digitally synthesized voice signals). The location signal could be generated, for example, by replaying a segment of a cassette tape (or solid-state memory chip which stores digitally encoded speech) on which the vehicle driver has recorded the location at which he last stopped the vehicle; for this purpose the alarm signal processor may include circuitry for controlling the operation of, say, a solenoid-operated cassette drive on which the message has been
95 recorded. Alternatively, one of a variety of automatic location signal generating methods may be used. For example circuitry could be provided to detect the direction of the apparatus 1 relative to two (or more) radio beacons and a triangulation method used to derive the position signal (such a position is likely soon to be made available, for example, from the Securicor-Wimpole automatic vehicle location system).
100

- The identification signal or any other part of the message may include a password or other type of verification information either as voice/audio or a digital code, which is changed
105 at intervals so as to make it more difficult for potential thieves to generate a false status condition report giving misleading location information, or the entire signal (including digitally encoded speech) may be encrypted.

- 110 The alarm condition signal may be transmitted through to the host as an analogue signal for example as a voice message recorded on tape or a digitally synthesized voice message or alternatively it can be delivered as digital data (the alarm signal processor 7 may include a modem for transmitting digital data); the processor 7 can be programmed to construct the required message (Identification/Location/Condition) from pre-recorded
115 taped segments or by synthesizing the appro-

priate words or phrases using the digital speech synthesizer chip. Where automatic status sensors are included in the status sensor block 5 and it is desired to transmit their condition reports in digital form, the alarm condition signal block 3 may include an analogue to digital converter to convert analogue status signals into digital signals. A number of analogue sensors may be served by a single analogue to digital converter by multiplexing their outputs into its input by means of suitable analogue gating circuitry.

Although the circuits 3, 7, 13 and 15 shown as separate functional blocks, it will be appreciated that particularly where, as is desirable, the alarm signal processor 7 is based around a suitably programmed microprocessor which an associated control-program ROM and workspace RAM, the functions of the blocks 3, 13 and 15, (at least insofar as they relate to the generation or activation of digital signals) may be provided by suitable programming of the microprocessor within the alarm signal processor 7. The microprocessor may, of course, have associated with its suitable support chips such as analogue to digital converter for the block 3, a digital speech synthesizer chip for generating the desired identification signal, location signal and status condition report, is provided.

The alarm signal processor 7 may be programmed so as to operate the automatic telephone dialler 9 in such a manner that if the first attempt by the dialler 9 to connect with the host fails, the attempt is repeated a number of times, optionally with one or more attempts to establish contact with the host via a different route, for example by attempting to dial up a different telephone number. Furthermore, the alarm signal processor 7, once activated, may operate the telephone dialler 9 so as to set the transmitter 11 so as to divert calls made into the subscriber number associated with the apparatus one to a different number so as to prevent the apparatus one from being disabled by an outside caller dialling it up and holding the line busy. Such a divert facility is available on some current public telephone and on cellular mobile radio networks and may be activated by the processor 7 issuing appropriate commands to the audiodialler to dial up the number and code required to re-direct incoming calls to a different number.

Various other applications of the present invention will be apparent. For example, a version of it may be used to perform remote medical diagnostics/monitoring. Medical instrumentation (e.g. pulse or blood pressure monitors) may be used as the sources of the status condition signals, so that for example the apparatus could be used to dial-up a remote host when an undesirable status is encountered. In this example, an individual may carry a portable cellular radio (or other suitable radio

transceiver) connected to the instrumentation. In turn, e.g. by typing in commands at a keyboard, a doctor or, automatically, a suitably programmed computer, at the remote host could issue instructions which are delivered via the processor 7 to associated local equipment e.g. to activate other instrumentation, or to pass a voice message to the individual concerned to advise on immediate remedial actions.

As far as vehicle monitoring is concerned, the invention is equally applicable to other forms of transportation e.g. to boats and yachts.

CLAIMS

1. Status monitoring apparatus comprising means for responding to status conditions and for reporting them to a remote location via a communication link which the apparatus is programmed to establish via a suitable medium.

2. Apparatus according to Claim 1, and adapted to establish the communication link via a switched communication network.

3. Apparatus according to Claim 2, and adapted to establish the communication link via a cellular telephone network.

4. Apparatus according to Claim 2, and adapted to establish the communication link via a switched radio.

5. Apparatus according to any one of the preceding claims and adapted to include in the condition report information as to the location of the apparatus.

6. Apparatus according to Claim 5, and including means for transmitting a voice message giving the location information.

7. Apparatus according to Claim 6, and including a voice recorder to record the voice message.

8. Apparatus according to claim 6, and including voice synthesizer circuitry for synthesizing the voice message and location circuitry for producing a signal indicating the location of the apparatus for use by the voice synthesizer to produce the voice message.

9. Apparatus according to claim 1, and including means to respond to and act on commands from the remote location.

10. Apparatus according to Claim 9, wherein said means are operative to alter the operating mode of the apparatus.

11. Apparatus according to Claim 9, wherein said means are operative to activate a slow-scan television camera, the slowscan television camera being arranged to send pictures via the communication link to the remote location.

12. Status reporting apparatus constructed and arranged to operate substantially as hereinbefore described with reference to the accompanying drawings.

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